IMAGE FROM GOOGLE EARTH SHOWING THE BREACH AND/OR EROSION AFTER THE 2013 STORMS (IMAGE DATE 10/2013) PURPLE BOX IS 2013 BREACH

IMAGE FROM GOOGLE EARTH SHOWING REPAIRS MADE AFTER THE 2015 STORM (IMAGE DATE 01/2018) RED OUTLINED ORANGE BOX ARE REPAIRS AFTER THE 2015 STORM EVENT

0 50 100 200 Feet

ENGINUITY ENGINEERING SOLUTIONS

10106 W SAN JUAN WAY
LITTLETON, CO 80127
PH: 303-872-9112
FX: 303-872-9104

SHEET TITLE:
ARROYO DOBLE NEIGHBORHOOD
MAP SHOWING ESTIMATED BREACH
LOCATIONS AND REPAIRS
FROM GOOGLE EARTH IMAGERY
DIGITAZED IN GIS

DESIGNED: NA
CHECKED:
DRAWN: Gerald E Blackler, PE, PhD
DATE: JULY 2018
PROJECT NUMBER:
DESIGN PACKAGE NUMBER:

ENGINEER CERTIFICATION:

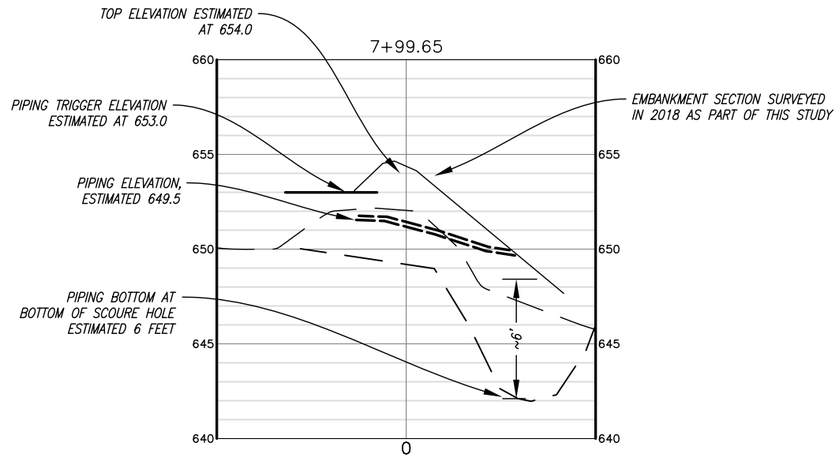
THIS MAP IS DRAFT AND CONFIDENTIAL
THIS MAP IS ONLY INTENDED FOR VIEWING
BY INDIVIDUALS IT HAS SPECIFICALLY BEEN
ADDRESSED

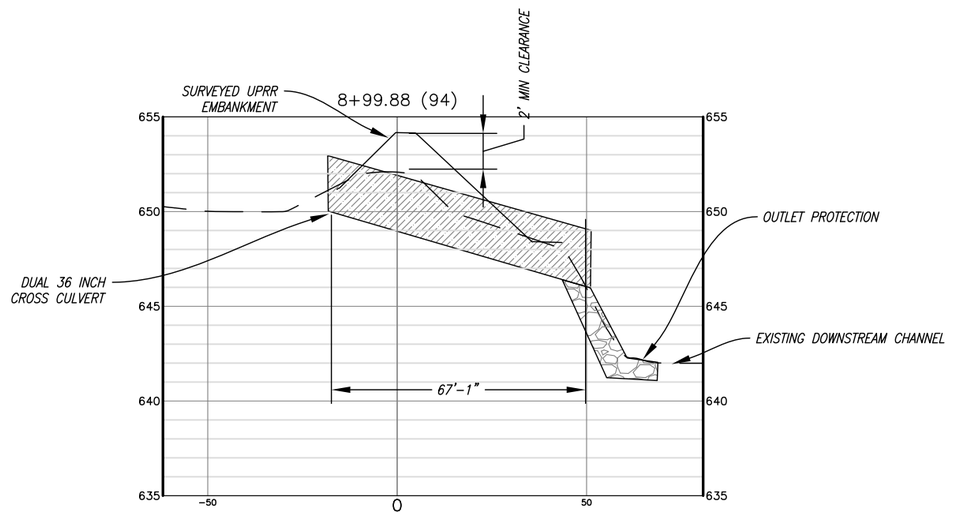
CONTOUR INTERVAL: 2-FOOT

DATUM:
AD_1983_STATEPLANE_TEXAS_CENTRAL_FIPS_4203_FEET
PLANE COORD. - NORTH, VERTICAL - NAVD88

SHEET NUMBER:
7 OF 7

ORIGINAL SCALE:
1 inch = 50 feet





EXAMPLE FLOOD CONTROL PROJECT LAYOUT

Attachment B – Rainfall information downloaded from NOAA

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Record of Climatological Observations

These data are quality controlled and may not be identical to the original observations.

Generated on 11/17/2017

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 698 ft. Lat: 30.0785° N Lon: -97.8481° W

Station: **BUDA 0.7 SW, TX US US1TXHYS131**

Observation Time Temperature: Unknown Observation Time Precipitation: Unknown

Year	Month	Day	Temperature (F)			Precipitation					Evaporation		Soil Temperature (F)					
			24 Hrs. Ending at Observation Time		At Observation	24 Hour Amounts Ending at Observation Time				At Obs. Time			4 in. Depth			8 in. Depth		
			Max.	Min.		Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)	24 Hour Wind Movement (mi)	Amount of Evap. (in)	Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2015	10	01				0.00		0.0										
2015	10	02																
2015	10	03																
2015	10	04																
2015	10	05																
2015	10	06																
2015	10	07																
2015	10	08																
2015	10	09																
2015	10	10																
2015	10	11																
2015	10	12				0.00												
2015	10	13				0.00												
2015	10	14				0.00												
2015	10	15				T												
2015	10	16																
2015	10	17				0.00												
2015	10	18				0.00												
2015	10	19				0.00												
2015	10	20				0.00												
2015	10	21				0.00												
2015	10	22				0.14												
2015	10	23				0.08												
2015	10	24				2.36												
2015	10	25				2.64												
2015	10	26				0.03												
2015	10	27																
2015	10	28																
2015	10	29																
2015	10	30				11.98												
2015	10	31				1.08												
		Summary				18.31		0.0										

Empty, or blank, cells indicate that a data observation was not reported.

*Ground Cover: 1=Grass; 2=Fallow; 3=Bare Ground; 4=Brome grass; 5=Sod; 6=Straw mulch; 7=Grass muck; 8=Bare muck; 0=Unknown

"s" This data value failed one of NCDC's quality control tests.

"T" values in the Precipitation or Snow category above indicate a "trace" value was recorded.

"A" values in the Precipitation Flag or the Snow Flag column indicate a multiday total, accumulated since last measurement, is being used.

Data value inconsistency may be present due to rounding calculations during the conversion process from SI metric units to standard imperial units.

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Record of Climatological Observations

These data are quality controlled and may not be identical to the original observations.

Generated on 11/16/2017

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 693 ft. Lat: 30.1122° N Lon: -97.7493° W

Station: **CREEDMOOR 1.5 NNW, TX US US1TXTV0135**

Observation Time Temperature: Unknown Observation Time Precipitation: Unknown

Year	Month	Day	Temperature (F)			Precipitation					Evaporation		Soil Temperature (F)					
			24 Hrs. Ending at Observation Time		At Observation	24 Hour Amounts Ending at Observation Time				At Obs. Time			4 in. Depth			8 in. Depth		
			Max.	Min.		Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)	24 Hour Wind Movement (mi)	Amount of Evap. (in)	Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2015	10	01				0.00		0.0										
2015	10	02				0.00		0.0										
2015	10	03				0.00		0.0										
2015	10	04				0.00		0.0										
2015	10	05				0.00		0.0										
2015	10	06				0.00		0.0										
2015	10	07				0.00		0.0										
2015	10	08				0.00		0.0										
2015	10	09				0.00		0.0										
2015	10	10				0.00		0.0										
2015	10	11				0.00		0.0										
2015	10	12				0.00		0.0										
2015	10	13				0.00		0.0										
2015	10	14				0.00		0.0										
2015	10	15				0.00		0.0										
2015	10	16				0.00		0.0										
2015	10	17				0.00		0.0										
2015	10	18				0.00		0.0										
2015	10	19				0.00		0.0										
2015	10	20				0.00		0.0										
2015	10	21				0.00		0.0										
2015	10	22				0.15												
2015	10	23				0.05												
2015	10	24				3.10												
2015	10	25				3.50												
2015	10	26				0.00		0.0										
2015	10	27				0.00		0.0										
2015	10	28				0.00		0.0										
2015	10	29				0.00		0.0										
2015	10	30				11.00												
2015	10	31				3.50												
		Summary				21.30		0.0										

Empty, or blank, cells indicate that a data observation was not reported.

*Ground Cover: 1=Grass; 2=Fallow; 3=Bare Ground; 4=Brome grass; 5=Sod; 6=Straw mulch; 7=Grass muck; 8=Bare muck; 0=Unknown

"s" This data value failed one of NCDC's quality control tests.

"T" values in the Precipitation or Snow category above indicate a "trace" value was recorded.

"A" values in the Precipitation Flag or the Snow Flag column indicate a multiday total, accumulated since last measurement, is being used.

Data value inconsistency may be present due to rounding calculations during the conversion process from SI metric units to standard imperial units.

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Record of Climatological Observations

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Generated on 11/16/2017

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 744 ft. Lat: 30.1368° N Lon: -97.8682° W

Station: **MANCHACA 2.1 ENE, TX US US1TXHYS028**

Observation Time Temperature: Unknown Observation Time Precipitation: Unknown

Year	Month	Day	Temperature (F)			Precipitation					Evaporation		Soil Temperature (F)					
			24 Hrs. Ending at Observation Time		At Observation	24 Hour Amounts Ending at Observation Time				At Obs. Time			4 in. Depth			8 in. Depth		
			Max.	Min.		Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)	24 Hour Wind Movement (mi)	Amount of Evap. (in)	Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2015	10	01				0.00		0.0										
2015	10	02				0.00		0.0										
2015	10	03				0.00		0.0										
2015	10	04				0.00		0.0										
2015	10	05				0.00		0.0										
2015	10	06				0.00		0.0										
2015	10	07				0.00		0.0										
2015	10	08				0.00		0.0										
2015	10	09				0.00		0.0										
2015	10	10				0.00		0.0										
2015	10	11				0.00		0.0										
2015	10	12				0.00		0.0										
2015	10	13				0.00		0.0										
2015	10	14				0.00		0.0										
2015	10	15				0.00		0.0										
2015	10	16				0.00		0.0										
2015	10	17				0.00		0.0										
2015	10	18				0.00		0.0										
2015	10	19				0.00		0.0										
2015	10	20				0.00		0.0										
2015	10	21				T		0.0										
2015	10	22				0.12		0.0										
2015	10	23				0.10		0.0										
2015	10	24				3.65		0.0										
2015	10	25				2.56		0.0										
2015	10	26				0.03		0.0										
2015	10	27				0.00		0.0										
2015	10	28				0.00		0.0										
2015	10	29				0.00		0.0										
2015	10	30				0.69		0.0										
2015	10	31				9.33		0.0										
		Summary				16.48		0.0										

Empty, or blank, cells indicate that a data observation was not reported.

*Ground Cover: 1=Grass; 2=Fallow; 3=Bare Ground; 4=Brome grass; 5=Sod; 6=Straw mulch; 7=Grass muck; 8=Bare muck; 0=Unknown

"s" This data value failed one of NCDC's quality control tests.

"T" values in the Precipitation or Snow category above indicate a "trace" value was recorded.

"A" values in the Precipitation Flag or the Snow Flag column indicate a multiday total, accumulated since last measurement, is being used.

Data value inconsistency may be present due to rounding calculations during the conversion process from SI metric units to standard imperial units.

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Record of Climatological Observations

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Generated on 11/16/2017

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 678 ft. Lat: 30.1435° N Lon: -97.8183° W

Station: **SAN LEANNA 0.1 SSE, TX US US1TXTV0175**

Observation Time Temperature: Unknown Observation Time Precipitation: Unknown

Year	Month	Day	Temperature (F)			Precipitation					Evaporation		Soil Temperature (F)					
			24 Hrs. Ending at Observation Time		At Observation	24 Hour Amounts Ending at Observation Time				At Obs. Time			4 in. Depth			8 in. Depth		
			Max.	Min.		Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)	24 Hour Wind Movement (mi)	Amount of Evap. (in)	Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2015	10	01				0.00		0.0										
2015	10	02				0.00		0.0										
2015	10	03				0.00		0.0										
2015	10	04				0.00		0.0										
2015	10	05				0.00		0.0										
2015	10	06				0.00		0.0										
2015	10	07				0.00		0.0										
2015	10	08				0.00		0.0										
2015	10	09				0.00		0.0										
2015	10	10				0.00		0.0										
2015	10	11				0.00		0.0										
2015	10	12				0.00		0.0										
2015	10	13																
2015	10	14				0.00		0.0										
2015	10	15				0.00		0.0										
2015	10	16				0.00		0.0										
2015	10	17				0.00		0.0										
2015	10	18																
2015	10	19				0.00		0.0										
2015	10	20				0.00		0.0										
2015	10	21				0.00		0.0										
2015	10	22				0.11												
2015	10	23				0.06												
2015	10	24				1.93												
2015	10	25				2.98												
2015	10	26				0.11												
2015	10	27				0.00		0.0										
2015	10	28				0.00		0.0										
2015	10	29				0.00		0.0										
2015	10	30				0.54												
2015	10	31				12.62												
		Summary				18.35		0.0										

Empty, or blank, cells indicate that a data observation was not reported.

*Ground Cover: 1=Grass; 2=Fallow; 3=Bare Ground; 4=Brome grass; 5=Sod; 6=Straw mulch; 7=Grass muck; 8=Bare muck; 0=Unknown

"s" This data value failed one of NCDC's quality control tests.

"T" values in the Precipitation or Snow category above indicate a "trace" value was recorded.

"A" values in the Precipitation Flag or the Snow Flag column indicate a multiday total, accumulated since last measurement, is being used.

Data value inconsistency may be present due to rounding calculations during the conversion process from SI metric units to standard imperial units.

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Record of Climatological Observations

These data are quality controlled and may not be identical to the original observations.

Generated on 07/11/2018

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 744 ft. Lat: 30.1368° N Lon: -97.8682° W

Station: **MANCHACA 2.1 ENE, TX US US1TXHYS028**

Observation Time Temperature: Unknown Observation Time Precipitation: Unknown

Year	Month	Day	Temperature (F)			Precipitation					Evaporation		Soil Temperature (F)					
			24 Hrs. Ending at Observation Time		At Observation	24 Hour Amounts Ending at Observation Time				At Obs. Time			4 in. Depth			8 in. Depth		
			Max.	Min.		Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)	24 Hour Wind Movement (mi)	Amount of Evap. (in)	Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2013	10	01				T		0.0										
2013	10	02				0.00		0.0										
2013	10	03				0.05		0.0										
2013	10	04				0.00		0.0										
2013	10	05																
2013	10	06				0.65		0.0										
2013	10	07				0.00		0.0										
2013	10	08				0.00		0.0										
2013	10	09				0.00		0.0										
2013	10	10				0.00		0.0										
2013	10	11				T		0.0										
2013	10	12				0.02		0.0										
2013	10	13				6.81		0.0										
2013	10	14				0.65		0.0										
2013	10	15				0.19		0.0										
2013	10	16				0.90		0.0										
2013	10	17				0.35		0.0										
2013	10	18				0.01		0.0										
2013	10	19				0.00		0.0										
2013	10	20				0.00		0.0										
2013	10	21				0.00		0.0										
2013	10	22				T		0.0										
2013	10	23				0.00		0.0										
2013	10	24				0.00		0.0										
2013	10	25				0.00		0.0										
2013	10	26				0.00		0.0										
2013	10	27				2.31		0.0										
2013	10	28				0.03		0.0										
2013	10	29				0.00		0.0										
2013	10	30				0.06		0.0										
2013	10	31				8.95		0.0										
		Summary				20.98		0.0										

Empty, or blank, cells indicate that a data observation was not reported.

*Ground Cover: 1=Grass; 2=Fallow; 3=Bare Ground; 4=Brome grass; 5=Sod; 6=Straw mulch; 7=Grass muck; 8=Bare muck; 0=Unknown

"s" This data value failed one of NCDC's quality control tests.

"T" values in the Precipitation or Snow category above indicate a "trace" value was recorded.

"A" values in the Precipitation Flag or the Snow Flag column indicate a multiday total, accumulated since last measurement, is being used.

Data value inconsistency may be present due to rounding calculations during the conversion process from SI metric units to standard imperial units.

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Record of Climatological Observations

These data are quality controlled and may not be identical to the original observations.

Generated on 07/11/2018

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 676 ft. Lat: 30.1596° N Lon: -97.8126° W

Station: **SAN LEANNA 1.1 NNE, TX US US1TXTV0196**

Observation Time Temperature: Unknown Observation Time Precipitation: Unknown

Year	Month	Day	Temperature (F)			Precipitation					Evaporation		Soil Temperature (F)					
			24 Hrs. Ending at Observation Time		At Observation	24 Hour Amounts Ending at Observation Time				At Obs. Time			4 in. Depth			8 in. Depth		
			Max.	Min.		Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)	24 Hour Wind Movement (mi)	Amount of Evap. (in)	Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2013	10	01				0.00		0.0										
2013	10	02				0.00		0.0										
2013	10	03				0.00		0.0										
2013	10	04				0.00		0.0										
2013	10	05				0.00		0.0										
2013	10	06				0.98												
2013	10	07				0.00		0.0										
2013	10	08				0.00		0.0										
2013	10	09				0.00		0.0										
2013	10	10				0.00		0.0										
2013	10	11				0.00		0.0										
2013	10	12				0.00		0.0										
2013	10	13				6.71												
2013	10	14				0.51												
2013	10	15				0.51												
2013	10	16				0.56												
2013	10	17				0.42												
2013	10	18				0.00		0.0										
2013	10	19				T												
2013	10	20				0.00		0.0										
2013	10	21				0.00		0.0										
2013	10	22				0.02												
2013	10	23				0.00		0.0										
2013	10	24				0.00		0.0										
2013	10	25				0.00		0.0										
2013	10	26				0.00		0.0										
2013	10	27				1.75												
2013	10	28				T												
2013	10	29				0.00		0.0										
2013	10	30				T												
2013	10	31				6.43												
		Summary				17.89		0.0										

Empty, or blank, cells indicate that a data observation was not reported.

*Ground Cover: 1=Grass; 2=Fallow; 3=Bare Ground; 4=Brome grass; 5=Sod; 6=Straw mulch; 7=Grass muck; 8=Bare muck; 0=Unknown

"s" This data value failed one of NCDC's quality control tests.

"T" values in the Precipitation or Snow category above indicate a "trace" value was recorded.

"A" values in the Precipitation Flag or the Snow Flag column indicate a multiday total, accumulated since last measurement, is being used.

Data value inconsistency may be present due to rounding calculations during the conversion process from SI metric units to standard imperial units.

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Record of Climatological Observations

These data are quality controlled and may not be identical to the original observations.

Generated on 07/11/2018

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 678 ft. Lat: 30.1435° N Lon: -97.8183° W

Station: **SAN LEANNA 0.1 SSE, TX US US1TXTV0175**

Observation Time Temperature: Unknown Observation Time Precipitation: Unknown

Year	Month	Day	Temperature (F)			Precipitation					Evaporation		Soil Temperature (F)					
			24 Hrs. Ending at Observation Time		At Observation	24 Hour Amounts Ending at Observation Time				At Obs. Time			4 in. Depth			8 in. Depth		
			Max.	Min.		Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)	24 Hour Wind Movement (mi)	Amount of Evap. (in)	Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2013	10	01																
2013	10	02				0.00		0.0										
2013	10	03																
2013	10	04																
2013	10	05																
2013	10	06				1.12												
2013	10	07																
2013	10	08																
2013	10	09																
2013	10	10				0.00		0.0										
2013	10	11																
2013	10	12				0.03												
2013	10	13				5.90												
2013	10	14				0.63												
2013	10	15																
2013	10	16				0.80												
2013	10	17				0.25												
2013	10	18																
2013	10	19																
2013	10	20																
2013	10	21				0.00		0.0										
2013	10	22				0.02												
2013	10	23																
2013	10	24																
2013	10	25																
2013	10	26				0.00		0.0										
2013	10	27				1.97												
2013	10	28				0.03												
2013	10	29																
2013	10	30																
2013	10	31				6.92												
		Summary				17.67		0.0										

Empty, or blank, cells indicate that a data observation was not reported.

*Ground Cover: 1=Grass; 2=Fallow; 3=Bare Ground; 4=Brome grass; 5=Sod; 6=Straw mulch; 7=Grass muck; 8=Bare muck; 0=Unknown

"s" This data value failed one of NCDC's quality control tests.

"T" values in the Precipitation or Snow category above indicate a "trace" value was recorded.

"A" values in the Precipitation Flag or the Snow Flag column indicate a multiday total, accumulated since last measurement, is being used.

Data value inconsistency may be present due to rounding calculations during the conversion process from SI metric units to standard imperial units.

Attachment C – Soils Information from the USDA

United States Department of Agriculture

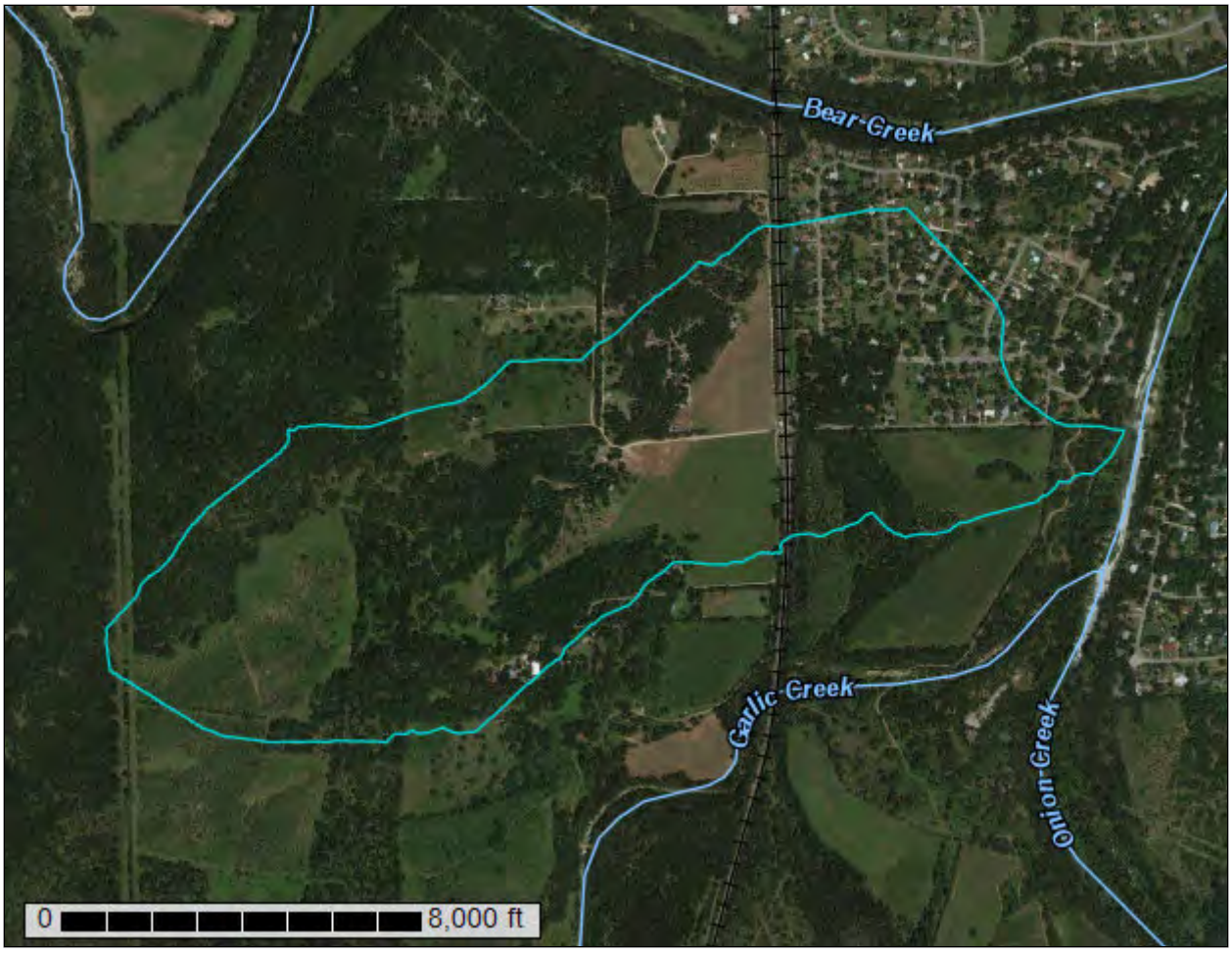
NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Comal and Hays Counties, Texas, and Travis County, Texas

Arroyo Doble Drainage



November 17, 2017

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

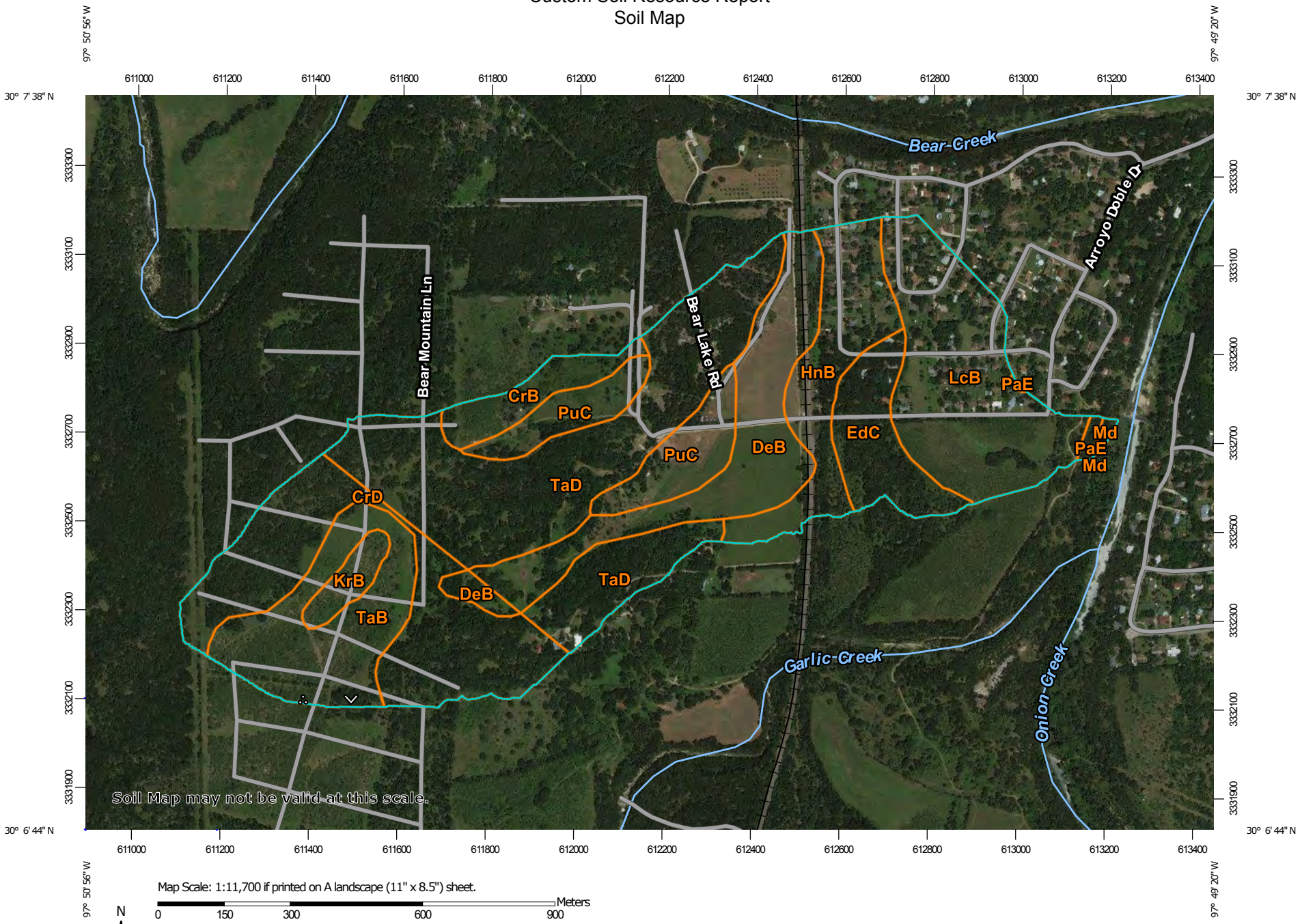
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at scales ranging from 1:20,000 to 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Comal and Hays Counties, Texas
Survey Area Data: Version 14, Nov 7, 2017

Soil Survey Area: Travis County, Texas
Survey Area Data: Version 19, Nov 8, 2017

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

MAP LEGEND

MAP INFORMATION

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Feb 8, 2015—Mar 14, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CrD	Comfort-Rock outcrop complex, 1 to 8 percent slopes	39.9	14.3%
DeB	Denton silty clay, 1 to 3 percent slopes	2.1	0.8%
KrB	Krum clay, 1 to 3 percent slopes	4.4	1.6%
TaB	Tarpley clay, 1 to 3 percent slopes	27.0	9.7%
Subtotals for Soil Survey Area		**73.5**	**26.4%**
Totals for Area of Interest		**278.8**	**100.0%**

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CrB	Crawford clay, 1 to 3 percent slopes	8.5	3.0%
DeB	Denton silty clay, 1 to 3 percent slopes	31.4	11.3%
EdC	Eddy gravelly loam, 3 to 6 percent slopes	14.9	5.4%
HnB	Houston Black clay, 1 to 3 percent slopes	23.1	8.3%
LcB	Lewisville silty clay, 1 to 3 percent slopes	40.2	14.4%
Md	Mixed alluvial land, 0 to 1 percent slopes, frequently flooded	0.5	0.2%
PaE	Patrick soils, 5 to 10 percent slopes	0.9	0.3%
PuC	Purves silty clay, 1 to 5 percent slopes	18.8	6.8%
TaD	Tarrant soils, 5 to 18 percent slopes	66.9	24.0%
Subtotals for Soil Survey Area		**205.3**	**73.6%**
Totals for Area of Interest		**278.8**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named

according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Comal and Hays Counties, Texas

CrD—Comfort-Rock outcrop complex, 1 to 8 percent slopes

Map Unit Setting

National map unit symbol: dq2m
Elevation: 300 to 8,700 feet
Mean annual precipitation: 10 to 36 inches
Mean annual air temperature: 52 to 73 degrees F
Frost-free period: 120 to 320 days
Farmland classification: Not prime farmland

Map Unit Composition

Comfort and similar soils: 70 percent
Rock outcrop: 15 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Comfort

Setting

Landform: Ridges
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from limestone

Typical profile

H1 - 0 to 6 inches: extremely stony clay
H2 - 6 to 13 inches: extremely stony clay
H3 - 13 to 20 inches: bedrock

Properties and qualities

Slope: 1 to 8 percent
Percent of area covered with surface fragments: 30.0 percent
Depth to restrictive feature: 9 to 20 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 20 percent
Available water storage in profile: Very low (about 1.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: Low Stony Hill 29-35" PZ (R081CY360TX)
Hydric soil rating: No

Description of Rock Outcrop

Setting

Landform: Ridges
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Limestone

Typical profile

H1 - 0 to 80 inches: bedrock

Properties and qualities

Slope: 1 to 8 percent
Depth to restrictive feature: 0 to 2 inches to lithic bedrock
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to very high (0.06 to 19.98 in/hr)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Unnamed

Percent of map unit: 15 percent
Hydric soil rating: No

DeB—Denton silty clay, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2t26l
Elevation: 570 to 1,870 feet
Mean annual precipitation: 31 to 36 inches
Mean annual air temperature: 65 to 68 degrees F
Frost-free period: 220 to 260 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Denton and similar soils: 88 percent
Minor components: 12 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Denton

Setting

Landform: Hillslopes

Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Silty and clayey slope alluvium over residuum weathered from limestone

Typical profile

A - 0 to 14 inches: silty clay
Bw - 14 to 25 inches: silty clay
Bk - 25 to 33 inches: silty clay
Ck - 33 to 36 inches: gravelly silty clay
R - 36 to 80 inches: bedrock

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: 22 to 60 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 80 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: D
Ecological site: Clay Loam 29-35" PZ (R081CY357TX)
Hydric soil rating: No

Minor Components

Krum

Percent of map unit: 6 percent
Landform: Drainageways
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Concave
Ecological site: Clay Loam 29-35" PZ (R081CY357TX)
Hydric soil rating: No

Doss

Percent of map unit: 4 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: Shallow 23-31" PZ (R081BY343TX)
Hydric soil rating: No

Anhalt

Percent of map unit: 2 percent
Landform: Hillslopes
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Deep Redland 29-35" PZ (R081CY358TX)
Hydric soil rating: No

KrB—Krum clay, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2t2j5
Elevation: 550 to 1,750 feet
Mean annual precipitation: 31 to 37 inches
Mean annual air temperature: 65 to 69 degrees F
Frost-free period: 230 to 250 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Krum and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Krum

Setting

Landform: Stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Calcareous silty and clayey alluvium derived from limestone

Typical profile

A - 0 to 16 inches: clay
Bk1 - 16 to 58 inches: clay
Bk2 - 58 to 66 inches: clay
Ck - 66 to 80 inches: clay

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Calcium carbonate, maximum in profile: 50 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 3.0
Available water storage in profile: High (about 9.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: Clay Loam 29-35" PZ (R081CY357TX)
Hydric soil rating: No

Minor Components

Bolar

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clay Loam 29-35" PZ (R081CY357TX)
Hydric soil rating: No

Doss

Percent of map unit: 3 percent
Landform: Hillslopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: Shallow 29-35" PZ (R081CY574TX)
Hydric soil rating: No

Lewisville

Percent of map unit: 2 percent
Landform: Stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear
Ecological site: Clay Loam 29-35" PZ (R081CY357TX)
Hydric soil rating: No

TaB—Tarpley clay, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2t2m9
Elevation: 570 to 2,300 feet
Mean annual precipitation: 30 to 37 inches
Mean annual air temperature: 64 to 68 degrees F

Frost-free period: 220 to 260 days
Farmland classification: Not prime farmland

Map Unit Composition

Tarpley and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tarpley

Setting

Landform: Hillslopes
Landform position (two-dimensional): Shoulder, summit, backslope
Landform position (three-dimensional): Side slope, interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Clayey residuum weathered from limestone

Typical profile

A - 0 to 6 inches: clay
Bt - 6 to 17 inches: clay
R - 17 to 60 inches: bedrock

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: 13 to 20 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 2 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 1.0
Available water storage in profile: Very low (about 2.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: D
Ecological site: Redland 29-35" PZ (R081CY361TX)
Hydric soil rating: No

Minor Components

Anhalt

Percent of map unit: 4 percent
Landform: Hillslopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Deep Redland 29-35" PZ (R081CY358TX)
Hydric soil rating: No

Doss

Percent of map unit: 2 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Shallow 29-35" PZ (R081CY574TX)
Hydric soil rating: No

Rock outcrop

Percent of map unit: 2 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope, interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Rumple

Percent of map unit: 2 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Gravelly Redland 29-35" PZ (R081CY359TX)
Hydric soil rating: No

Travis County, Texas

CrB—Crawford clay, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2rspf
Elevation: 400 to 1,100 feet
Mean annual precipitation: 26 to 34 inches
Mean annual air temperature: 64 to 68 degrees F
Frost-free period: 230 to 250 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Crawford and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Crawford

Setting

Landform: Plains
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from limestone

Typical profile

A - 0 to 6 inches: clay
Bss - 6 to 27 inches: clay
R - 27 to 30 inches: bedrock

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 2 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: D
Ecological site: Deep Redland 29-35" PZ (R081CY358TX)
Hydric soil rating: No

Minor Components

Fairlie

Percent of map unit: 4 percent
Landform: Ridges
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Convex
Ecological site: Blackland 28-40" PZ (R086AY196TX)
Hydric soil rating: No

Denton

Percent of map unit: 4 percent
Landform: Ridges
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Convex
Ecological site: Clay Loam 29-35" PZ (R081CY357TX)
Hydric soil rating: No

Georgetown

Percent of map unit: 4 percent
Landform: Plains
Landform position (two-dimensional): Summit, footslope
Landform position (three-dimensional): Interfluve, base slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Redland 29-35" PZ (R081CY361TX)
Hydric soil rating: No

Purves

Percent of map unit: 2 percent
Landform: Ridges
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: Shallow 29-35" PZ (R081CY574TX)
Hydric soil rating: No

Unnamed

Percent of map unit: 1 percent
Hydric soil rating: No

DeB—Denton silty clay, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2t26l

Elevation: 570 to 1,870 feet
Mean annual precipitation: 31 to 36 inches
Mean annual air temperature: 65 to 68 degrees F
Frost-free period: 220 to 260 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Denton and similar soils: 88 percent
Minor components: 12 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Denton

Setting

Landform: Hillslopes
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Silty and clayey slope alluvium over residuum weathered from limestone

Typical profile

A - 0 to 14 inches: silty clay
Bw - 14 to 25 inches: silty clay
Bk - 25 to 33 inches: silty clay
Ck - 33 to 36 inches: gravelly silty clay
R - 36 to 80 inches: bedrock

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: 22 to 60 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 80 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: D
Ecological site: Clay Loam 29-35" PZ (R081CY357TX)
Hydric soil rating: No

Minor Components

Krum

Percent of map unit: 6 percent
Landform: Drainageways
Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Concave
Ecological site: Clay Loam 29-35" PZ (R081CY357TX)
Hydric soil rating: No

Doss

Percent of map unit: 4 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: Shallow 23-31" PZ (R081BY343TX)
Hydric soil rating: No

Anhalt

Percent of map unit: 2 percent
Landform: Hillslopes
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Deep Redland 29-35" PZ (R081CY358TX)
Hydric soil rating: No

EdC—Eddy gravelly loam, 3 to 6 percent slopes

Map Unit Setting

National map unit symbol: f54z
Elevation: 400 to 1,000 feet
Mean annual precipitation: 31 to 39 inches
Mean annual air temperature: 64 to 70 degrees F
Frost-free period: 230 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Eddy and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Eddy

Setting

Landform: Ridges
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from austin chalk

Typical profile

H1 - 0 to 4 inches: gravelly loam
H2 - 4 to 14 inches: gravelly clay loam
H3 - 14 to 20 inches: bedrock

Properties and qualities

Slope: 3 to 6 percent
Depth to restrictive feature: 3 to 15 inches to paralithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 80 percent
Available water storage in profile: Very low (about 1.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: Southern Chalky Ridge (R086AY002TX)
Hydric soil rating: No

Minor Components

Unnamed

Percent of map unit: 5 percent
Hydric soil rating: No

HnB—Houston Black clay, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2ssh0
Elevation: 270 to 1,040 feet
Mean annual precipitation: 33 to 43 inches
Mean annual air temperature: 62 to 63 degrees F
Frost-free period: 217 to 244 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Houston black and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Houston Black

Setting

Landform: Ridges
Landform position (two-dimensional): Summit, shoulder

Landform position (three-dimensional): Interfluve
Microfeatures of landform position: Linear gilgai
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Parent material: Clayey residuum weathered from calcareous mudstone of upper cretaceous age

Typical profile

Ap - 0 to 6 inches: clay
Bkss - 6 to 70 inches: clay
BCkss - 70 to 80 inches: clay

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 35 percent
Gypsum, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: High (about 9.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: D
Ecological site: Blackland 28-40" PZ (R086AY196TX)
Hydric soil rating: No

Minor Components

Heiden

Percent of map unit: 15 percent
Landform: Plains
Microfeatures of landform position: Linear gilgai
Down-slope shape: Linear
Across-slope shape: Convex
Ecological site: Blackland 28-40" PZ (R086AY196TX)
Hydric soil rating: No

Fairlie

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Convex
Ecological site: Blackland 28-40" PZ (R086AY196TX)
Hydric soil rating: No

LcB—Lewisville silty clay, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2vtgn
Elevation: 240 to 1,470 feet
Mean annual precipitation: 32 to 44 inches
Mean annual air temperature: 63 to 68 degrees F
Frost-free period: 240 to 270 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Lewisville and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lewisville

Setting

Landform: Stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Calcareous clayey alluvium derived from mudstone

Typical profile

Ap - 0 to 15 inches: silty clay
Bk1 - 15 to 38 inches: silty clay
Bk2 - 38 to 69 inches: silty clay

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Salinity, maximum in profile: Nonsaline (0.7 to 1.1 mmhos/cm)
Available water storage in profile: High (about 9.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: Southern Clay Loam (R086AY007TX)
Hydric soil rating: No

Minor Components

Altoga

Percent of map unit: 10 percent
Landform: Stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Convex
Ecological site: Southern Clay Loam (R086AY007TX)
Hydric soil rating: No

Branyon

Percent of map unit: 5 percent
Landform: Stream terraces, stream terraces
Landform position (three-dimensional): Tread
Microfeatures of landform position: Circular gilgai, circular gilgai
Down-slope shape: Linear
Across-slope shape: Convex
Ecological site: Blackland 28-40" PZ (R086AY196TX)
Hydric soil rating: No

Md—Mixed alluvial land, 0 to 1 percent slopes, frequently flooded

Map Unit Setting

National map unit symbol: f65p
Elevation: 750 to 2,000 feet
Mean annual precipitation: 18 to 30 inches
Mean annual air temperature: 66 to 70 degrees F
Frost-free period: 220 to 270 days
Farmland classification: Not prime farmland

Map Unit Composition

Alluvial land, mixed: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Alluvial Land, Mixed

Setting

Landform: Flood plains, flood plains
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Calcareous gravelly alluvium of quaternary age derived from mixed sources

Typical profile

H1 - 0 to 48 inches: stratified very gravelly coarse sand to very gravelly sand

Properties and qualities

Slope: 0 to 1 percent
Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Frequency of flooding: Frequent
Calcium carbonate, maximum in profile: 90 percent
Available water storage in profile: Very low (about 2.9 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Ecological site: Loamy Bottomland (R086AY012TX)
Hydric soil rating: No

PaE—Patrick soils, 5 to 10 percent slopes

Map Unit Setting
National map unit symbol: f65t
Elevation: 800 to 1,900 feet
Mean annual precipitation: 28 to 34 inches
Mean annual air temperature: 66 to 70 degrees F
Frost-free period: 258 to 270 days
Farmland classification: Not prime farmland

Map Unit Composition
Patrick and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Patrick

Setting
Landform: Paleoterraces
Landform position (three-dimensional): Riser
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Clayey alluvium of quaternary age derived from mixed sources and/or sandy alluvium of quaternary age derived from mixed sources

Typical profile
H1 - 0 to 15 inches: clay
H2 - 15 to 72 inches: gravelly loamy sand

Properties and qualities
Slope: 5 to 10 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 55 percent

Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: Southern Chalky Ridge (R086AY002TX)
Hydric soil rating: No

Minor Components

Unnamed

Percent of map unit: 5 percent
Hydric soil rating: No

PuC—Purves silty clay, 1 to 5 percent slopes

Map Unit Setting

National map unit symbol: f65y
Elevation: 400 to 1,800 feet
Mean annual precipitation: 27 to 37 inches
Mean annual air temperature: 64 to 68 degrees F
Frost-free period: 210 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Purves and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Purves

Setting

Landform: Plains
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from limestone

Typical profile

H1 - 0 to 15 inches: silty clay
H2 - 15 to 17 inches: bedrock

Properties and qualities

Slope: 1 to 5 percent
Depth to restrictive feature: 8 to 20 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.57 in/hr)
Depth to water table: More than 80 inches

Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Very low (about 2.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Ecological site: Shallow 29-35" PZ (R081CY574TX)
Hydric soil rating: No

Minor Components

Unnamed

Percent of map unit: 5 percent
Hydric soil rating: No

TaD—Tarrant soils, 5 to 18 percent slopes

Map Unit Setting

National map unit symbol: f667
Elevation: 800 to 3,100 feet
Mean annual precipitation: 15 to 34 inches
Mean annual air temperature: 63 to 70 degrees F
Frost-free period: 210 to 280 days
Farmland classification: Not prime farmland

Map Unit Composition

Tarrant, pe >44, and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tarrant, Pe >44

Setting

Landform: Plains
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from limestone

Typical profile

H1 - 0 to 8 inches: very stony clay
H2 - 8 to 12 inches: bedrock

Properties and qualities

Slope: 5 to 18 percent
Depth to restrictive feature: 6 to 20 inches to lithic bedrock
Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Very low (about 0.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: Low Stony Hill 29-35" PZ (R081CY360TX)
Hydric soil rating: No

Minor Components

Unnamed

Percent of map unit: 5 percent
Hydric soil rating: No

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

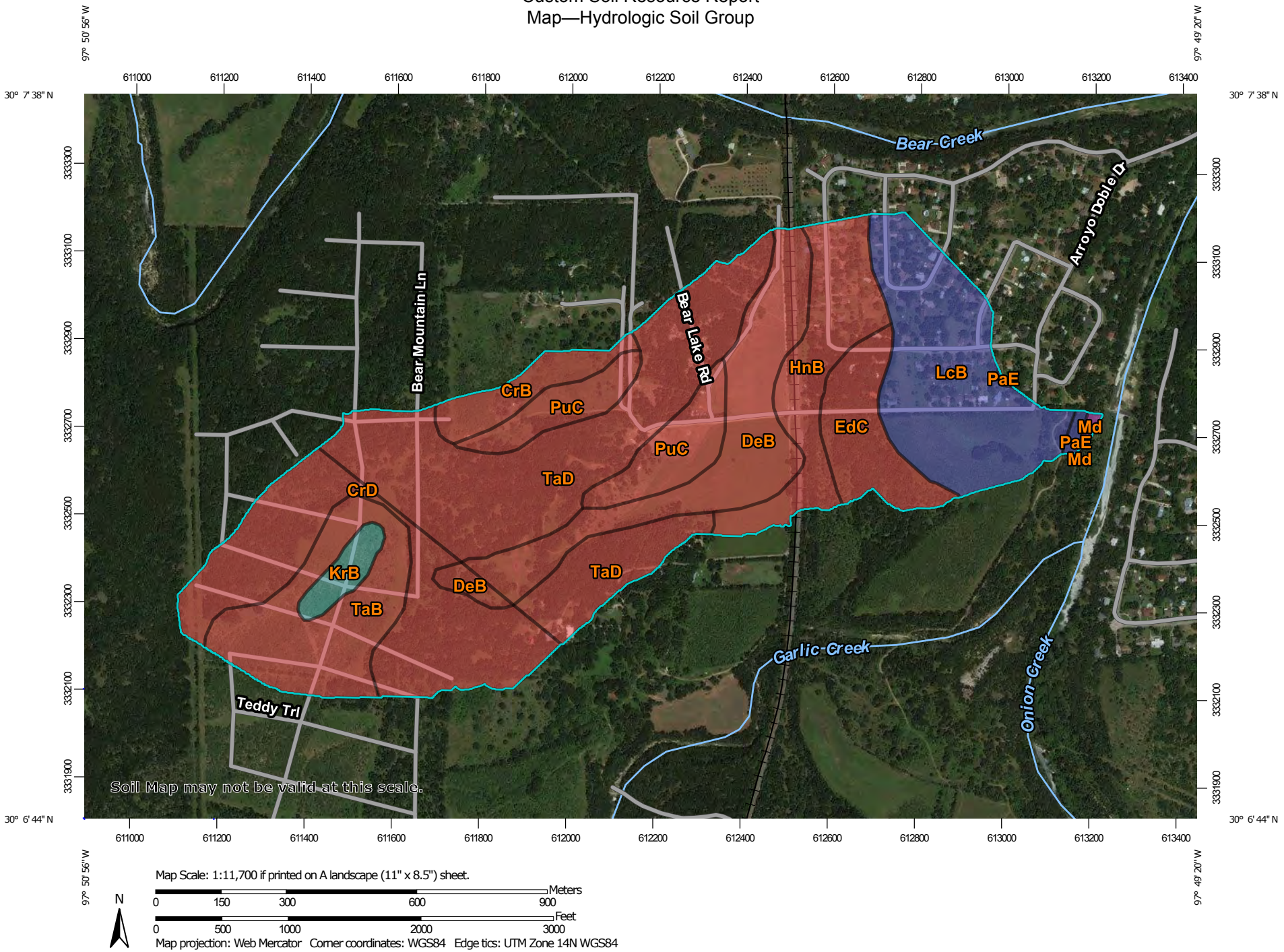
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Custom Soil Resource Report
Map—Hydrologic Soil Group



Map Scale: 1:11,700 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 150 300 600 900

Feet: 0 500 1000 2000 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 14N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at scales ranging from 1:20,000 to 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Comal and Hays Counties, Texas
Survey Area Data: Version 14, Nov 7, 2017

Soil Survey Area: Travis County, Texas
Survey Area Data: Version 19, Nov 8, 2017

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

MAP LEGEND

MAP INFORMATION

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Feb 8, 2015—Mar 14, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CrD	Comfort-Rock outcrop complex, 1 to 8 percent slopes	D	39.9	14.3%
DeB	Denton silty clay, 1 to 3 percent slopes	D	2.1	0.8%
KrB	Krum clay, 1 to 3 percent slopes	C	4.4	1.6%
TaB	Tarpley clay, 1 to 3 percent slopes	D	27.0	9.7%
Subtotals for Soil Survey Area			**73.5**	**26.4%**
Totals for Area of Interest			**278.8**	**100.0%**

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CrB	Crawford clay, 1 to 3 percent slopes	D	8.5	3.0%
DeB	Denton silty clay, 1 to 3 percent slopes	D	31.4	11.3%
EdC	Eddy gravelly loam, 3 to 6 percent slopes	D	14.9	5.4%
HnB	Houston Black clay, 1 to 3 percent slopes	D	23.1	8.3%
LcB	Lewisville silty clay, 1 to 3 percent slopes	B	40.2	14.4%
Md	Mixed alluvial land, 0 to 1 percent slopes, frequently flooded	A	0.5	0.2%
PaE	Patrick soils, 5 to 10 percent slopes	B	0.9	0.3%
PuC	Purves silty clay, 1 to 5 percent slopes	D	18.8	6.8%
TaD	Tarrant soils, 5 to 18 percent slopes	D	66.9	24.0%
Subtotals for Soil Survey Area			**205.3**	**73.6%**
Totals for Area of Interest			**278.8**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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